3GPP TSG-SA WG2#151E e-meeting S2-2204689

Elbonia, 16 - 20 May 2022

Source: Qualcomm Incorporated

Title: Motivation for New TEI18 WID on Differentiating QoS for QUIC using Connection ID

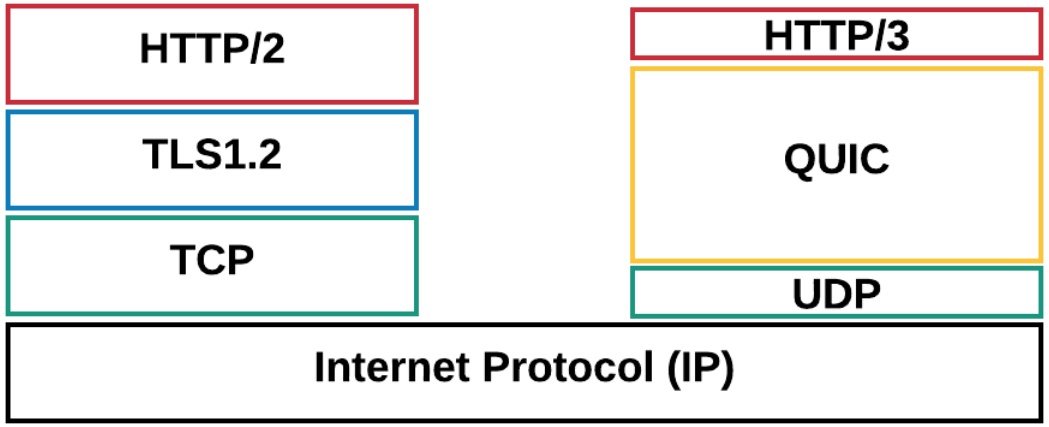
Document for: Discussion/Information

Agenda Item: 10.5

Work Item / Release: TEI18 / Rel-18

Introduction

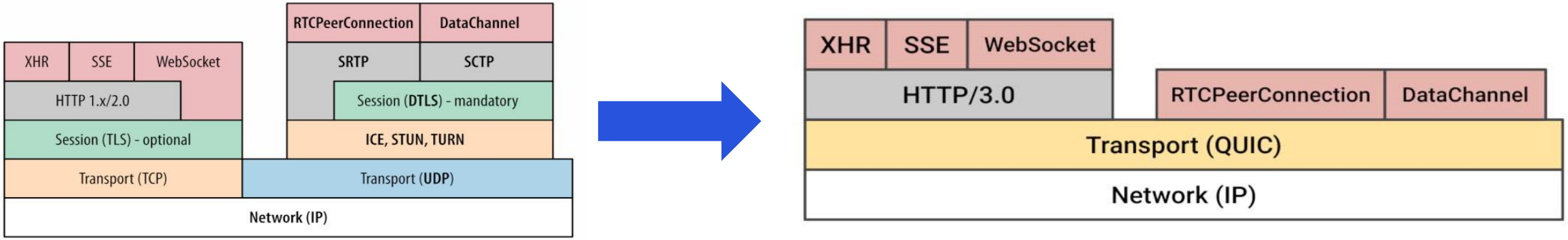
- IETF QUIC is a standard IETF protocol (RFC9000)
- All major browsers, web server, and CDN have QUIC implementations
- QUIC is growing quickly and accounted for 20% of Internet traffic (as of August 2021)
- QUIC functions
  - Connection+Stream multiplexing
  - TLS1.3 (messages)
  - Loss recovery
  - In-order delivery (within stream)
  - Congestion control, Flow control
  - IP+UDP performs more like IP, i.e., identify endpoints



Use Case(s)

5G Support for Low Latency Applications over QUIC

- Growing trends of supporting low latency applications such as game streaming over web browser (e.g., xCloud, GeForceNow, Stadia)
- New framework is being worked on as WebTransport as evolution of WebRTC



- 5G is not well equipped to provided QoS to QUIC flows due to lack of visibility (encryption) in the header
  - Only some streams in a connection may need QoS
  - QoS requirement for each stream may be different (e.g., audio vs video vs control)

Picture from https://bloggeek.me/who-needs-quic-in-webrtc/

QUIC Stream Feature

- Most fields in QUIC header are encrypted except for Destination/Source connection ID
- Stream MUX
  - One Connection ID can multiplex multiple streams
  - No blocking between streams
  - Streams can be added/removed independently
  - Streams also be dependent of another stream (e.g., removal of parent stream -> dependent)
  - Independent flow control on each connection and stream

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+
|0|1|S|R|R|K|P P|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                Destination Connection ID (0..160)           ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     Packet Number (8/16/24/32)              ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     Protected Payload (*)                   ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

                Figure 14: Short Header Packet Format
```

3GPP QoS

- 3GPP typically uses 5-tuple to identify a flow:
  - <Source IP, Destination IP, Source port, Destination port, Protocol ID>
- At QUIC layer each stream can be identified by a unique Connection ID, but they will all share the same 5-tuple
- E.g., a Video Telephony application may use 3 streams within one QUIC session
  - One stream for signaling
  - One stream for audio
  - One stream for video
- If an application is using QUIC as its transport, current Packet Filter Set attributes are not enough to identify specific QUIC streams and separate in different QoS flows with differentiated QoS.
- This differentiation is important since:
  - Only some QUIC streams in a connection may have stringent QoS requirements.
  - QUIC requirements for each stream may be different (e.g. audio vs. video vs. control).

Proposed enhancement

- Enhance the 5G core network and NAS protocol to be able to identify and provide differentiated QoS for different QUIC streams within a same PDU session.
- Objectives for this work item consist of:
  - Include "QUIC source connection ID range" and "QUIC destination connection ID range" as attributes for Packet Filter Set definition.
  - Exchange of QUIC connection ID packet filter support capability.
  - Enhancement to Reflective QoS to create packet filters based on source/destination connection ID when QUIC applies.
- Packet Filter:
  - Different QoS flows for different QUIC source/destination connection IDs.
  - Each QoS flow assigned QoS requirements accordingly.
  - New value for Protocol ID / Next Header: “UDP+QUIC”
- Reflective QoS:
  - When Protocol ID / Next Header is set to "UDP+QUIC", UE uses the source and destination IP addresses, source and destination port numbers, the Destination connection ID and if present the Source connection ID of QUIC header.